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| 4110MATHS  Semester 1  *Maths* | LINEAR ALGEBRA  (20c) | *Aim:*  To provide the basic concepts and techniques of linear algebra.  To develop manipulative skills in matrix algebra.  To utilise appropriate software packages with linear algebra facilities, e.g.  MAPLE/MATLAB/MAXIMA.  Complete a World of Work Skills Reflection | *Learning activities:*  Lectures will introduce concepts, which students will practise in MAPLE TA | *Assessment:*  Maple TA in-class test. (45%) Self Awareness Statement (10%) Maple TA in-class test. (45%) |
| 4111MATHS  Semester 1  *Maths* | MODELLING 1  (20c) | *Aim:*  To introduce the student to fundamentals of algebra and functions which will be built upon in mathematical methods in Semester 2 and complements applications in modelling 2 | *Learning activities:*  Lectures, tutorials, laboratory session, directed study | *Assessment:*  Continual online assessment (50%) Curve sketching 2000words (50%) |
| 4112MATHS  Semester 1  *Maths* | MATHEMATICAL COMPUTER PROGRAMMING  (20c) | *Aim:*  To develop IT problem solving skills  To become familiar with a range of mathematical programming techniques  To gain an understanding of how software is developed  To prepare students for mathematical software development at higher levels, both work and study | *Learning activities:*  Lectures – to introduce the programming theories and techniques  Lab exercises – programs for students to write and test.  Further exercises – practical examples for students to work on in their own time  Directed reading – background reading to enable the lab work to be completed. | *Assessment:*  Coursework 1 (40%) Coursework 2 (60%) |
| 5100MATHS  Semester 1  *Maths* | FURTHER MATHEMATICAL METHODS  (20c) | *Aim:*  To further the study of mathematical methods in the areas of multidimensional calculus such as partial differentiation and multiple integration and applications, together with elements of discrete mathematics such as linear programming,  difference equations, graph theory & networks, game theory, etc. | *Learning activities:*  Lectures reinforced by tutorial classes and online problems. | *Assessment:*  Multivariable Calculus (30%) Examination (70%) |
| 5104MATHS  Semester 1  *Maths* | PERSONAL AND PROFESSIONAL DEVELOPMENT  (20c) | *Aim:*  To develop employability skills focusing on career management, recruitment and selection.  To develop presentation skills.  To develop the ability to self-analyse and reflect.  To develop advanced IT skills that will enable students to solve a range of problems in Mathematics and Statistics. | *Learning activities:*  Lectures, Tutorials and coursework assignments.  External speakers from industry. | *Assessment:*  CV and Presentation (50%) Assessment of IT skills (50%) |
| 6109MATHS  Semester 1  *Maths* | ADVANCED CALCULUS  (20c) | *Aim:*  Extend students' mastery of calculus in application areas such as vectors, complex numbers transforms and series. | *Learning activities:*  Lectures and tutorials, solving problems in vector and complex calculus and transformations. | *Assessment:*  Application casy study (40%) Examination (60%) |
| 6110MATHS  Semester 1  *Maths* | MATHEMATICAL BIOLOGY  (20c) | *Aim:*  This course will teach the application of mathematical models to a variety of problems in biology and medicine. The aims of the course are:  To introduce mathematical models of biological systems and techniques for analysing them.  To enable students to appreciate and understand how mathematics can be used to model biological systems. | *Learning activities:*  Lectures, tutorials, directed reading. | *Assessment:*  Coursework (30%) Examination (70%) |
| 6111MATHS  Semester 1  *Maths* | EXPERIMENTAL NUMBER THEORY  (20c) | *Aim:*  Experimental Number Theory aims to familiarise students with the concepts of number theory from a computational perspective. It seeks to introduce students to some topics in elementary number theory based on formulation of conjectures from experimental data. | *Learning activities:*  Lectures, seminars, workshops, guided reading, online tasks, independent study. | *Assessment:*  Exploratory problems (60%) Examination (40%) |
| 7010DATSCI  Semester 1  *Maths* | Introduction to Data Analytics  (20c) | *Aim:*  The module aims to provide an introduction to students from differing academic disciplines to the key concepts of data types, compilation, management, querying, cleaning and visualisation. | *Learning activities:*  Lectures  Directed Reading  Supervised Computer Lab activities  Unsupervised Lab activities / Homework | *Assessment:*  Written Assignment (30%) Computer Assignment (70%) |
| 7011DATSCI  Semester 1  *Maths* | Statistical Methods in R  (20c) | *Aim:*  The module aims to provide an introduction to students from differing academic disciplines to key concepts in statistics and statistical computing using the R programming language, with an emphasis on the informed interpretation of the results of statistical testing. | *Learning activities:*  Lectures  Directed Reading  Computer Exercises | *Assessment:*  Computer Assignments (100%) |
| 7012DATSCI  Semester 1  *Maths* | Big Data Computing  (20c) | *Aim:*  The module aims to develop skills in modern computing techniques for high performance analysis of large data sets and an understanding of how to translate an analysis problem to best exploit such techniques. | *Learning activities:*  • Lectures  • Computer based exercises  • Directed Reading | *Assessment:*  In-class test (30%) Design a big data system (70%) |
| 4101MATHS  Semester 2  *Maths* | MATHEMATICAL METHODS  (20c) | *Aim:*  To provide a thorough grounding in the basic mathematical concepts and methods  needed to solve a range of problems with scientific, business and statistical  applications.  To develop a firm foundation for single variable calculus.  To provide a basic grounding in vector algebra.  To introduce the concepts of complex numbers and their application.  To introduce multivariable calculus.  To introduce methods for solving ordinary first and second order differential  equations. | *Learning activities:*  Lectures, tutorials and laboratory-based activities | *Assessment:*  Problem solving (30%) Examination (70%) |
| 4113MATHS  Semester 2  *Maths* | MODELLING 2  (20c) | *Aim:*  To introduce the student to mathematical modelling and analytical reasoning linked to real-world applications.  To introduce students to algorithms for, and practical applications of linear algebra. | *Learning activities:*  Group work in preparation for assessed presentation.  Lectures and problem solving sessions in MAPLE TA. | *Assessment:*  Online tests and questions (50%) Sports data and MAPLE TA (50%) |
| 5103MATHS  Semester 2  *Maths* | NUMERICAL METHODS  (20c) | *Aim:*  Develop an understanding of the need to analyse and interpret numerical solutions to problems.  Enable students to study and investigate the error of certain numerical methods.  Provide practical experience in the use of numerical methods and appropriate  software.  Computations involving real and complex dynamical systems.  Gain understanding of methods of constructing fractals.  Gain confidence in independent study to solve equations and problems arising in dynamical systems and fractal analysis. | *Learning activities:*  Through lectures, tutorials and private study students will investigate the mathematics and practical implementation of numerical methods and then go on to use appropriate mathematical software to develop their understanding  of the subject area. | *Assessment:*  Num methods, Chaos/Fractals (75%) Exam (25%) |
| 5105MATHS  Semester 2  *Maths* | Differential Equations  (20c) | *Aim:*  To build on differential equation theory that was introduced in Mathematical Methods (4101MATHS) and provide a comprehensive coverage of initial value problems in one independent variable and an introduction to boundary value problems.  To introduce students to systems of ordinary differential equations (ODEs) and determine how to solve linear autonomous systems of ODEs.  To introduce the concepts of asymptotic theory as a tool for analytically approximating the solution of differential equations. | *Learning activities:*  A combination of lectures, tutorials and directed reading. | *Assessment:*  Online tests and problems (40%) Examination (60%) |
| 6101MATHS  Semester 2  *Maths* | OPERATIONAL RESEARCH  (20c) | *Aim:*  To examine a wide range of operational research methods and their applicability to real-life problems encountered in business and industry. | *Learning activities:*  Lectures reinforced by tutorials and computer-laboratory sessions | *Assessment:*  OR problems & report (30%) Examination (70%) |
| 7020DATSCI  Semester 2  *Maths* | Research Methods in Data Science  (20c) | *Aim:*  The module aims to equip students with the research skills necessary to undertake their dissertation project, including the preparation of a research proposal or business case for the activity (depending on the academic/industrial context), consideration of ethical and legal issues, literature review, oral and written presentation skills and project management. | *Learning activities:*  Lectures  Seminar discussions  Peer to peer presentations  Directed Reading  Literature searches  Writing Assignments | *Assessment:*  Class Test (50%) Project Proposal (50%) |
| 7021DATSCI  Semester 2  *Maths* | Data Mining  (20c) | *Aim:*  The module aims to develop skills in data mining, using methods from computational learning theory and artificial intelligence to extract previously unknown relationships from large data sets. | *Learning activities:*  Lectures  Seminar discussions  Directed Reading  Computer based exercises | *Assessment:*  Report based on data mining (50%) Examination (50%) |
| 7022DATSCI  Semester 2  *Maths* | Big Data Analysis  (20c) | *Aim:*  The module aims to develop skills in big data analysis, including techniques of dimensionality reduction and the application of statistical and machine learning models. In addition it aims to develop the key skill of working with experts from other domains. | *Learning activities:*  Lectures  Seminar discussions  Directed Reading  Computer based exercises | *Assessment:*  Report on big data analysis (60%) In-class Test (40%) |
| 6100MATHS  Yearlong  *Maths* | PROJECT  (40c) | *Aim:*  To develop and widen the student's experience of tackling a substantial realistic problem selected from the domain of their programme by carrying out independent, yet supervised, research.  To extend the students ability to communicate the solution to a significant problem. | *Learning activities:*  Introductory lectures are provided to guide students on how to carry out a substantial research project. These are on Project Specification, Research Methods, Project Structure, Literature Review, Data Analysis and Plagiarism.  Students will attend weekly guidance sessions in the form of seminars which will cover project progress, research carried out, discussions regarding direction of research, project planning and management and report writing. | *Assessment:*  Powerpoint Presentation (10%) Poster Presentation (10%) Project Report (80%) |